

INTRODUCTION TO MIMIC-II

Electronic health record (EHR) systems provide a rich source of clinical data, and secondary use of this data to answer clinical research questions is becoming increasingly important. EHR data is far less expensive both in terms of time and cost compared to data collected prospectively for research purposes.

The Multiparameter Intelligent Monitoring in Intensive Care II (MIMIC-II) database¹ contains de-identified² EHR data on over 32,000 intensive care unit (ICU) patients from Beth Israel Deaconess Medical Center in Boston, MA between 2001 and 2008. The Laboratory for Computational Physiology at the Massachusetts Institute of Technology (MIT) maintains the MIMIC-II database under a grant from the National Institute of Biomedical Imaging and Bioengineering. Researchers who accept the data use agreement and have completed human subjects training can apply for permission to access the data.¹

We are collaborating with MIT to standardize and improve the quality of the data in MIMIC-II and provide a mirror site for the database plus the associated waveform data. We are also using the data to answer clinical research questions and experiment with natural language processing (NLP) techniques.

References

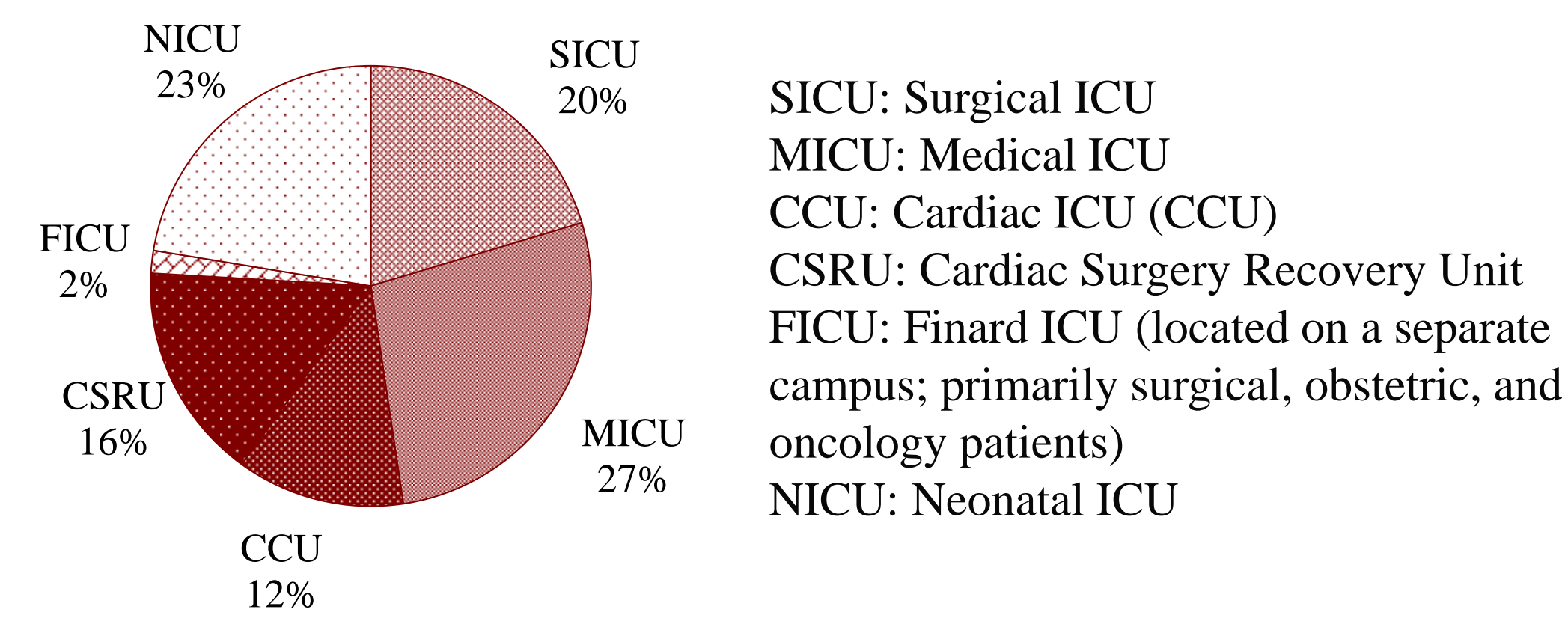
1. Saeed M, Villarroel M, Reisner AT, Clifford G, Lehman LW, Moody G, Heldt T, Kyaw TH, Moody B, Mark RG. Multiparameter Intelligent Monitoring in Intensive Care II (MIMIC-II): A public-access intensive care unit database. Crit Care Med. 2011 Jan 28.
2. Neamatullah I, Douglass M, Lehman LH, Reisner A, Villarroel M, Long WJ, Szolovits P, Moody GB, Mark RG, Clifford GD. Automated de-identification of free-text medical records. BMC Med Inform Decis Mak, 8(32), 2008.

MIMIC-II: A Database of 30,000+ Patients for ICU Research

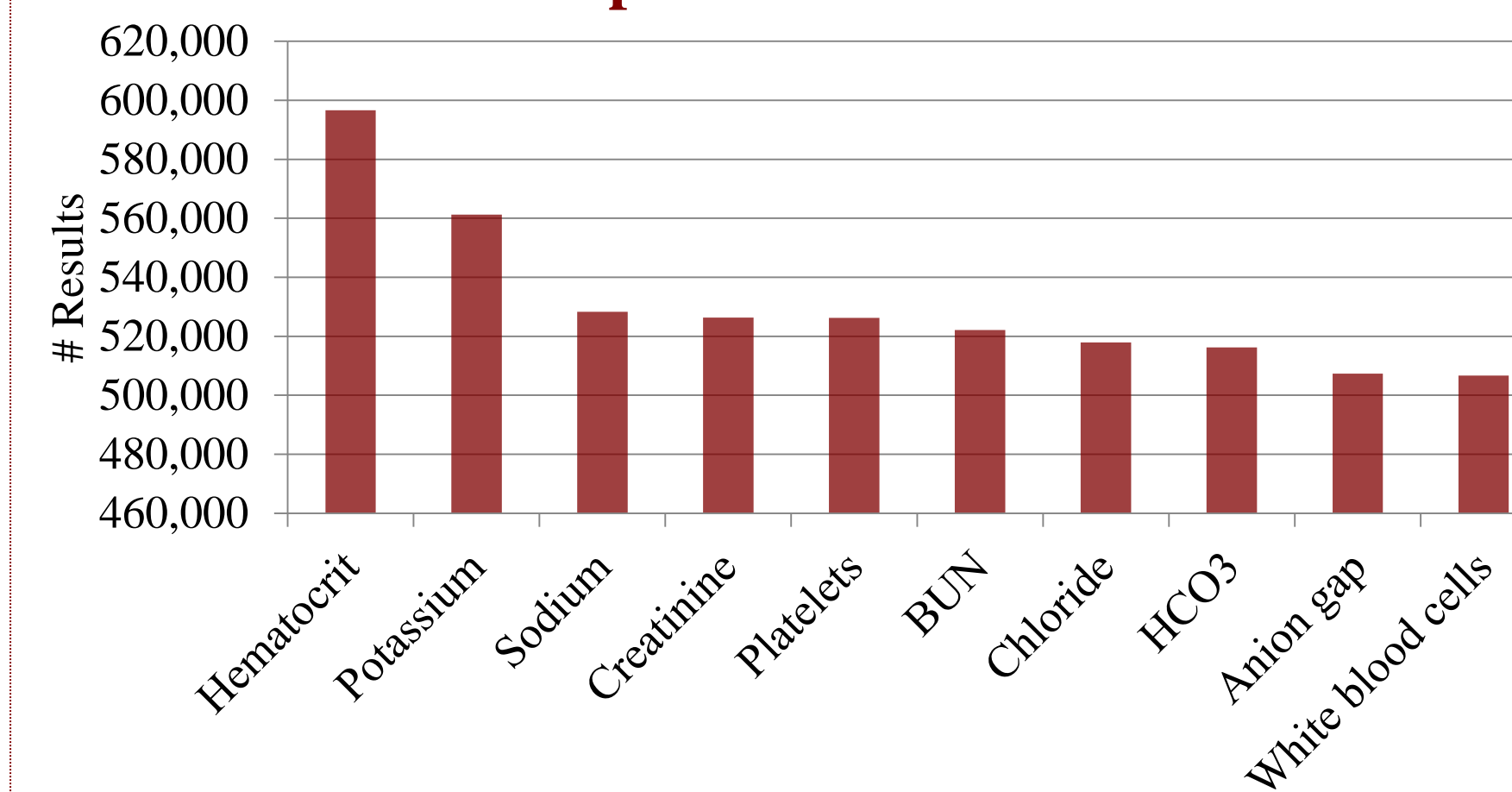
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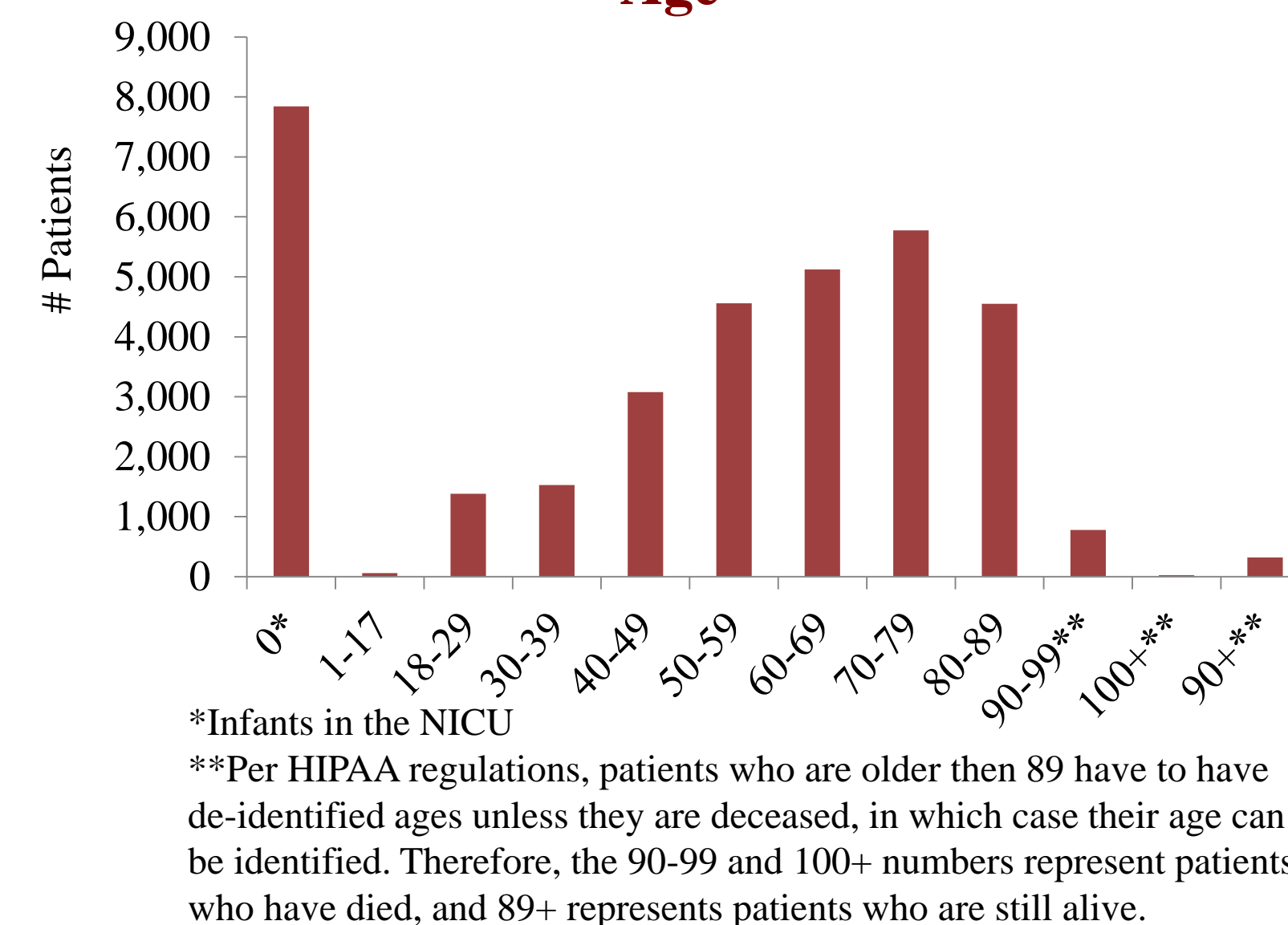
First ICU Service



Top 10 Lab Results



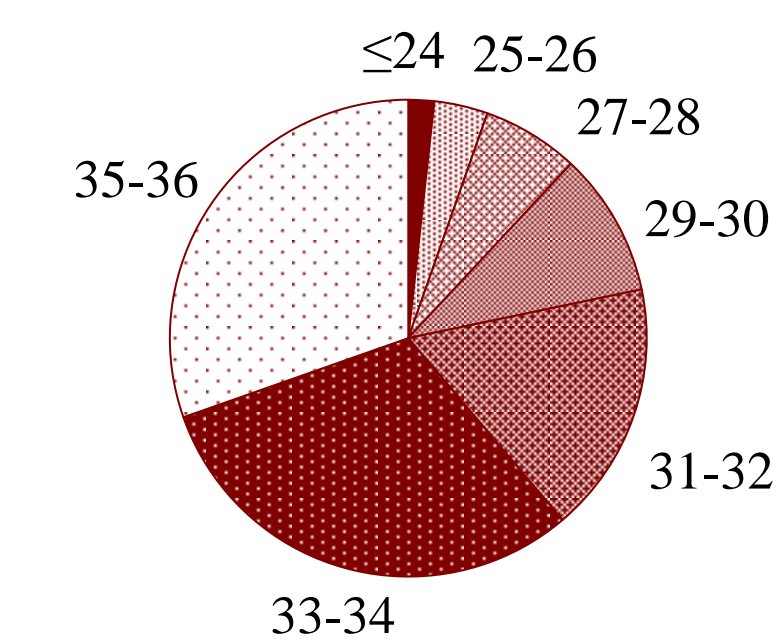
Age



Clinical and billing data

- Physiologic data
 - › Vital signs
 - › Ventilator parameters
 - › Pain scores
 - › I's and O's
- Medications
- Notes
 - › Admission notes (NICU only)
 - › Progress notes
 - › Discharge summaries
 - › Radiology reports
- Discharge and billing information
 - › ICD-9 codes
 - › Diagnosis-related groups (DRGs)
- Death data

Neonatal prematurity distribution (weeks gestation)



Top 10 adult primary discharge diagnoses

- Coronary atherosclerosis of native coronary artery
- Septicemia
- Subendocardial infarction, initial episode of care
- Congestive heart failure
- Respiratory failure
- Diabetes with ketoacidosis
- Hypertensive kidney disease
- Acute respiratory failure
- Aortic valve disorder
- Intracerebral hemorrhage

CURRENT PROJECTS

- Clinical research studies
 - › Determining the impact of obesity and overweight on short- and long-term mortality after critical illness
Results: patients who are obese or overweight have lower mortality risk after critical illness compared to normal weight patients (submitted for journal publication, working on revisions)
 - › The role of blood transfusions and feeding practices on the development of necrotizing enterocolitis in newborns
Study in progress
 - › Assessing whether Vitamin B12 levels can predict mortality risk for patients in the ICU
Preliminary results: Vitamin B12 levels do not predict ICU mortality when liver function is taken into account
- Informatics
 - › Developing natural language processing methods to extract important data, such as discharge destination and smoking status, from free-text notes that is not available elsewhere in the record.
 - › Mapping variables to standard terminologies such as LOINC and RxNorm to assess the coverage of the standard vocabularies and to make the data more useful for other researchers
- Statistics
 - › Developing the Maximum Likelihood method to address the measurement error in NLP-derived variables in order to reduce bias

CONCLUSION

MIMIC-II is a valuable source of clinical and administrative data for both adult and neonatal ICU patients. We are using the data for clinical, informatics, and statistics research, and we welcome suggestions from the NIH community for new research ideas and potential collaborations.